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W. ROBERT MOORE

A BRAZILIAN MISS DEMONSTRATES AN ANTIQUE COFFEE-MAKING CLOCK (Bulletin No. 4)

Bulletin No. 1, February 7, 1949

Rhodes Again Makes International News

THE efforts of the United Nations at Rhodes (Rodos) to mediate the Israel-Arab trouble have again focused international attention on that eastern Mediterranean island with a centuries-old record of international importance. Greeks, Romans, Turks, and Italians have ruled Rhodes, a spot half the size of Rhode Island at the southeast corner of the Aegean Sea. It was among the conquests of Alexander the Great. During the Roman era the island was a cultural center, with a school of public speaking attended by such orators as Brutus, Cicero, and Cato.

Since prehistoric times its fertile land has been cultivated and villages have dotted its shores and green valleys. For centuries Rhodes has been a trading station on sea routes between East and West.

Knights of St. John Set Character of City

Early in the 14th century the Knights of St. John of Jerusalem took over. Rhodes, capital city, stands today almost as the Knights rebuilt it on the ancient site at the northern point of the island. It is one of the most perfect examples of a medieval fortified city in the world. Massive walls and moat, and huge castles rise in amphitheater form from three harbors—two artificial (illustration, next page), one natural—none capable of handling large ships.

To the south and west, outside the old walled city of the Knights, rise the buildings the Italians put up during their regime. There is little evidence of the ancient town founded in 408 B.C. by settlers from Asia Minor; few traces remain of the Greek and Roman periods except broken relics in the museum and the foundations of the breakwaters—later topped with superstructures by the Knights.

But in spite of French renaissance buildings of the crusading Knights, centuries of Roman, Byzantine, and Turkish rule, and relatively brief Italian domination, Greek language and customs have prevailed all down the centuries. Modern Rhodians speak a Greek dialect, and the majority of the islanders are of the Greek Orthodox faith. About 85 per cent of them are Greek, the remainder a mixture of many mid-East strains.

Turkey Nearest Mainland Neighbor

Rhodes is the largest of a number of islands which Italy took from Turkey in 1912, and named the Italian Islands of the Aegean. With the exception of Rhodes and one or two scattered islands, the group had been known for some time as the Dodecanese Islands.

Rhodes is shaped like an Indian arrowhead. Its rugged tip points northeast to the coast of Turkey, a dozen miles away.

Down the island's center, a distance of about 48 miles, runs a mountain range. Its highest peak, Attairo, rises about midway of the island, more than 4,000 feet above the forests, grainfields, and vineyards. At its widest point, Rhodes extends not more than 20 miles.

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J. BAYLOR ROBERTS

AT CROWN POINT, THE COLUMBIA BREAKS THROUGH THE FINAL CASCADE FOOTHILLS AND ENTERS THE SLOW-FLOWING STRETCH TO THE SEA

The Pacific Northwest's great river provides scenic beauty as well as power and irrigation waters (Bulletin No. 2). The little structure on the bluff at the right commands extensive river vistas. It is on the Oregon bank a few miles upstream from Portland, which is to the left of the picture. Columbia's power is developed farther upstream.

Bulletin No. 2, February 7, 1949

Columbia River System Works Hard for Man

"THE Pacific Northwest's greatest resource"—the Columbia River—is now working on a double shift for the Pacific Northwest. Irrigation and power are its two main contributions.

Few river systems in the United States work harder for man. But the mighty Columbia still labors reluctantly, like an incompletely broken wild horse, and occasionally goes wild with flood despite the halters and checkreins of dams, diversion canals, and overflow reservoirs.

A River of Changes

But day in and day out, the giant works docilely, punching the time clock on countless irrigated farms and at several power dams. And daily its output increases. Last year Columbia waters poured onto the Pasco unit of 5,400 acres, first of the dry sections in Washington State to be watered under the Columbia Basin Irrigation Project, the nation's largest. Soon, as additional appropriations open more units of the project, 17,000 farms will flower in the desert—a fertile area large enough to lose Rhode Island in.

The Columbia is a river of changes, and so is the land it flows through. It rises among the rains, snows, and glaciers of the Canadian Rockies, cuts across the arid reaches of the vast Columbia Basin, then slices through the Cascade Range (illustration, inside cover) and Coast Range to reach one of the rainiest areas in the United States.

The Cascade Range, rising inland from the British Columbia, Washington, and Oregon coasts, blocks off from most of the inland basin the rain-bearing winds of the Pacific. The western slopes of the range are green and damp. To the east lies a land threatened by drought in sun-baked summers and by flood when melting snows in the high mountains start waters racing toward the sea.

From headwaters in the Selkirk Mountains of southeast British Columbia to its Pacific outlet along the Washington-Oregon border, the Columbia system covers some 300,000 square miles of territory. Parts of half a dozen northwest states, as well as British Columbia, are drained by a complex network of streams ranging from the Canadian Kootenay to Oregon's Willamette, which meets the Columbia near Portland, Oregon.

Man's Work Transforms Area

Chief tributary of the system is the Snake River, flowing into southern Washington from western Idaho. Near the Snake-Columbia junction, on the opposite side of the river, another important and unruly tributary, the Yakima, joins the main stream in the vicinity of the fast-growing irrigation center of Pasco, Washington.

Power and irrigation projects based on the Columbia system already have changed life in this region and set programs in motion for its future development.

As in building the Panama Canal, lakes and rivers were created or dried up. Settlements were drowned, transferred, or rebuilt. Water was

The island has no harbors for large vessels, and only one real town. Before the war, the city of Rhodes had nearly 28,000 residents, a little less than half the population of the island.

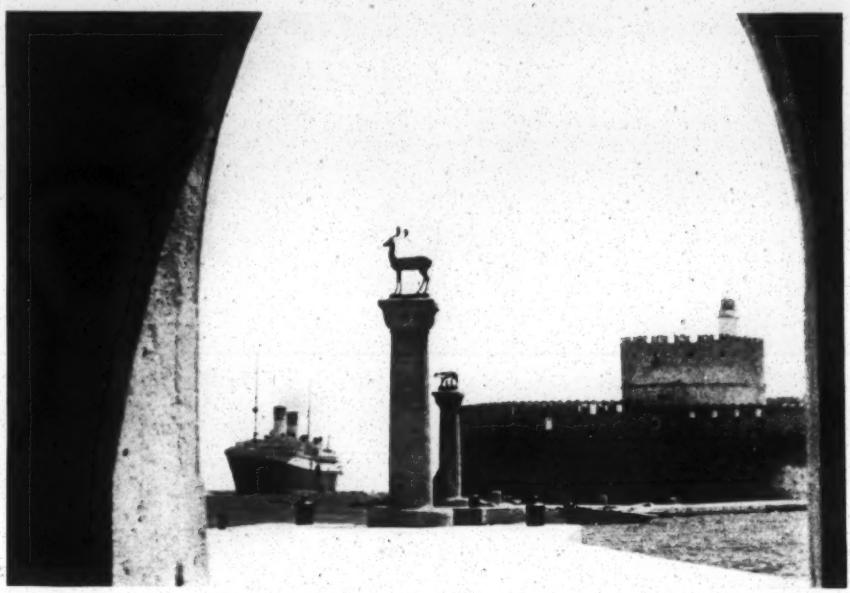
The chief exports are sponges, oil, and fruits including apricots, grapes, oranges, melons, and figs. Imports include cotton material and a good deal of food. Although grain flourishes, the islanders grow only about a third enough food for their own use. Among the industries are tobacco and olive oil processing, and the manufacture of pottery and tiles, as well as some lace and carpet making.

One of the chief charms of Rhodes is its mild, pleasant climate. The Greeks hope to develop the island as a popular resort, adding to the number of hotels the Italians built to attract tourists.

Among the noteworthy landmarks left by the Knights are the Hospital, now a museum, the Palace of the Grand Master, and the long straight Street of the Knights. On the old stone buildings that border this narrow thoroughfare are carved coats of arms of the Knights who defended the city walls against invaders of the Middle Ages.

NOTE: Rhodes may be located on the National Geographic Society's map of Bible Lands and the Cradle of Civilization. Write the Society's headquarters, Washington 6, D. C., for a price list of maps.

For further information, see "Rhodes, and Italy's Aegean Islands," in the *National Geographic Magazine* for April, 1941*; and "Souvenirs of Knighthood in Rhodes" (13 color photographs), December, 1933. *(Issues marked with an asterisk are included on a special list of Magazines available to teachers in packets of ten for $1.00.)*



L. V. BUSCHMAN

ANIMAL STATUES, SYMBOLIZING RHODES AND ROME, GUARD THE SEA GATE TO RHODES

The two pillars rise at the ends of moles which shut off a shallow harbor from the open sea. On the nearest one stands the antlered deer representative of Rhodes; on the other, the suckling wolf signifying Rome. A lighthouse rises from the Tower of St. Nicholas (right), relic of the Knights. According to tradition, the Colossus of Rhodes, huge statue of Apollo, stood astride the harbor entrance with a foot on each breakwater. Though it is known to have stood in a prominent place near the harbor, its exact location is unknown. The steamship cannot enter, but anchors in the open roadstead.

Bulletin No. 3, February 7, 1949

Gold Inspires Man's Deepest Descents

THE depths to which man will go for gold or diamonds (illustration, next page) do not exceed the depths a photographer will plumb for a good picture. This fact was illustrated recently by Volkmar Wentzel, National Geographic Society photographer now making a photographic survey of India.

A recent issue of an Indian pictorial magazine published in Bombay described Wentzel's visit to the Kolar Gold Fields in the State of Mysore. It noted that the young American "photographed the underground workings, being lowered the last 200 feet in a bucket to the bottom of a shaft nearly 9,000 feet below the surface, where possibly the deepest picture in the world was taken."

Gold the Greatest Lure

When this account reached the Society's headquarters in Washington, D. C., it raised an interesting conjecture: just how far below the earth's surface has man penetrated, and why?

Gold has been the greatest lure. The yellow metal has turned man into a mole whose deepest burrowings toward the core of the earth have been made in the Crown Mine near Johannesburg, Transvaal, Union of South Africa. There miners work close to a 9,000-foot depth. India's gold diggers nearly match South Africa's in downward plumb, however, according to the recent report of photographer Wentzel's feat.

Elsewhere, miners rarely go even half as deep as in these gold mines. The 9,000-foot depth is looked on as about the limit for profitable mining of gold, although exploratory bores in the Crown Mine have approached 11,000 feet. Earth heat and humidity necessitate powerful air-conditioning equipment for workers in deep Transvaal mines. Lifting ore, men, and equipment from the great depths is expensive.

Similarly, the law of diminishing returns virtually rules out coal mining below 3,000 feet. Exceptional shafts in Belgium, England, Australia, and Nova Scotia go a few hundred feet deeper. The deepest United States coal mines, in Pennsylvania, go 2,200 feet down, which is little more than the average Belgian working depth. At Glace Bay, Cape Breton Island, coal is mined undersea four miles from the shaft entrance, but only about 2,000 feet straight down.

Oil Drills Go Deepest

Speleologists (cave explorers), with fanatical zeal, follow natural cave passages wherever they can squeeze their bodies through. Deep caves are plentiful in the Alps and the Pyrenees. The deepest known cave, in the French Alps, stops short of 2,200 feet—one-fourth the African gold miner's floor. At Carlsbad, New Mexico, the third and lowest level of 32 miles of natural caverns is 1,320 feet.

In drilling for oil, man makes his deepest earth penetration without going below the surface himself. One Texas hole, though it never produced, was drilled three and one-seventh miles before being abandoned.

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made to run uphill, mountains of rock and soil removed, and other mountains of concrete raised in their place.

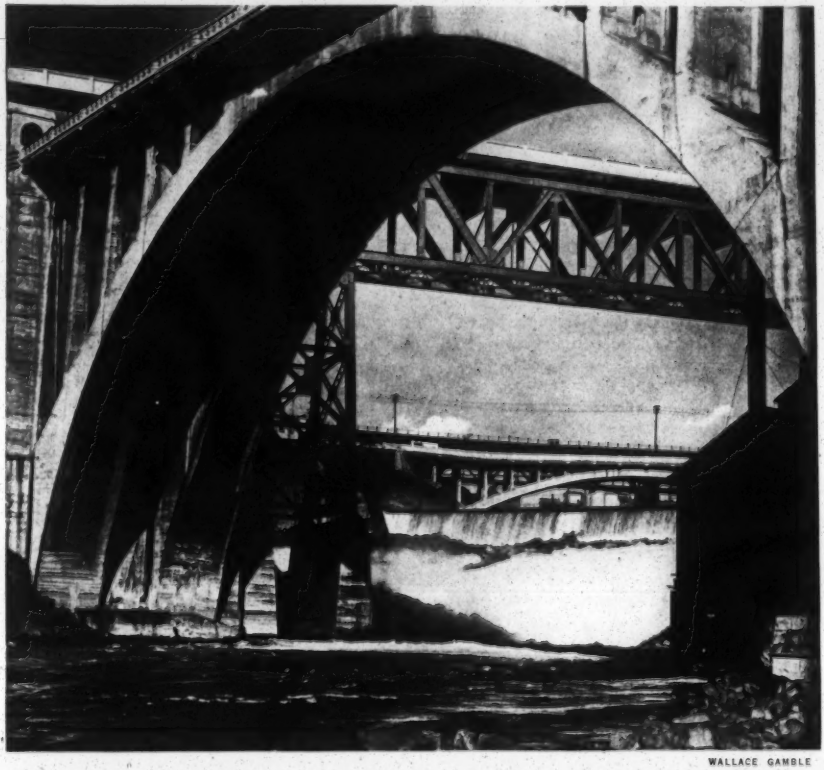
The largest dams and power plants are at down-river Bonneville and at Grand Coulee in the central Columbia section. The latter, in fact, is the greatest dam in the world. Power and irrigation projects at other places and on tributaries (illustration, below) round out the Columbia system's usefulness to man.

World War II brought new armament and supply industries to draw on the new power. It also introduced a still newer kind of power and industry along the Columbia, in the plutonium plant set up at Hanford, Washington, to help create atomic energy.

The work of the Columbia Basin Irrigation Project received a temporary setback late last spring when the river went on one of its worst flood rampages. The city of Vanport, Oregon, near the Willamette junction, was almost completely destroyed.

NOTE: The Columbia River basin is shown on the Society's Map of Northwestern United States and Neighboring Canadian Provinces.

For additional information, see "Oregon Finds New Riches," in the *National Geographic Magazine* for December, 1946; and "The Columbia Turns on the Power," June, 1941; and, in the GEOGRAPHIC SCHOOL BULLETINS, March 4, 1946, "Flood Control Planned for the Willamette, Oregon's Nile."



WALLACE GAMBLE

THE COLUMBIA'S POWER-CONSCIOUS, NUMBER-TWO CITY SPRANG UP AROUND SPOKANE FALLS

Spokane (pronounced as in "thus spoke Ann") used electric toasters and hair curlers before older cities. Power from the Spokane River, a Columbia tributary, helped its quick growth.

Bulletin No. 4, February 7, 1949

Atomic Clock Re-Splits the Split Second

THE "atomic clock" developed by the National Bureau of Standards is the most recent of man's many efforts to create the perfect timepiece. The watch on the wrist or the clock on the wall may be accurate enough to get you to the office or the railroad station on time, but they are woefully inadequate for such time measurements as are needed for tuning a radio transmitter or controlling the speed of power-plant generators.

In fact, each of us is more dependent on time and its precise measurement than we are aware of. Modern civilization could not operate if people were suddenly unable to measure time. X-ray equipment, teletype machines, parking meters, cameras, radar, lighthouse flashes, railroad operation, radio transmission, power development, ocean-depth measurement—those are some of today's varied equipment and activity which require extremely accurate timing.

Standard Pitch Depends on Time

Even music is measured by time. A musical note of any particular pitch represents so many vibrations per second of a violin string, a drumhead, or the air volume in the tube of a trumpet or a tuba. The more vibrations per second, the higher the pitch.

To help musicians and musical-instrument manufacturers tune their instruments accurately, the Bureau of Standards broadcasts a continuous musical note precisely tuned to A above middle C. This note is the nation's "standard of pitch" and its most monotonous radio program.

Before the atomic clock started "ticking," the turning earth was the master clock by which all other timepieces were set. Weighing well over six sextillion tons, the earth revolves at a speed that varies less than the works of the best clock ever made. However, there *is* variation in the earth's turning; so scientists looked to atomic vibrations for a better standard of time.

On every clear night, an astronomer at the Naval Observatory in Washington, official keeper of the nation's time, checks how fast the earth is turning. As the astronomer rides around on the earth, he notes what time he passes directly under a certain star. The interval between any two times when the astronomer passes under that star is always the same within an extremely tiny fraction of a second.

Bureau of Standards Broadcasts Each Second

By this standard the Naval Observatory regulates its radio time signals, sent out every two hours on the odd hour and heard all over the world. But in today's split-second civilization, accurate time telling is not enough. Time measuring is equally important.

To provide an accurate measure of time, the National Bureau of Standards broadcasts another and far more frequent time signal that goes out each second (omitting the 59th of each minute), all day and all night, a continuous "tick-tick-tick."

This "standard second," previously accurate to one part in one mil-

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Oil flows from two and two-thirds miles down in a productive well of the Louisiana bayou country.

In plumbing ocean depths, no other human beings have ever approached the record of 3,028 feet (nearly three-fifths of a mile) made in 1934 by Dr. William Beebe and Otis Barton. Their bathysphere descent in Bermuda waters was sponsored by the National Geographic Society.

A year later, the Society and the Army Air Corps teamed in organizing the stratosphere balloon flight of Captains Stevens and Anderson to a height of 13.71 miles above the South Dakota plains. This is still man's farthest aloft.

NOTE: For additional information, see "Coal: Prodigious Worker for Man," in the *National Geographic Magazine* for May, 1944*; "Bolivia—Tin Roof of the Andes," March, 1943*; "Cities That Gold and Diamonds Built," December, 1942; "Tin, the Cinderella Metal," November, 1940; and "Beyond Australia's Cities," December, 1936.

UNION OF SOUTH AFRICA AIR SERVICE

DIGGING FOR DIAMONDS. MAN SCOOPED OUT THIS GREAT HOLE AT KIMBERLEY, SOUTH AFRICA

A quarter of a mile deep and almost a mile in circumference, this mine has long been idle. In the 1870's, it was a goal in the Kimberley diamond rush which brought thousands of men to South Africa.

Bulletin No. 5, February 7, 1949

Bordeaux Still Thrives on Wine Industry

BORDEAUX, prewar France's and the world's greatest wine-exporting port, presents one of the brightest spots in the French recovery program. Wine production in the Bordeaux area again equals prewar figures.

As far back as 1874 Bordeaux shipped 28 million gallons of wine, an average through that year of 50 gallons a minute. Wine production fluctuates wildly from year to year, depending on what the weather conditions are when the grapes are growing. For instance, almost twice as much was turned out in 1939 as in 1938.

Different Wines from Different Soils

Bordeaux, France's fifth-largest city, is its third-most-important port though located 60 miles from the open Atlantic. Six miles of wharves extend along the Garonne River, which, a few miles below the city, opens out into the Gironde estuary, a wide avenue to the sea.

Vineyards surround Bordeaux, covering the valleys of the Garonne and Dordogne. The chateaux of the owners are islands in a vast sea of vines. The Medoc Peninsula, flat triangle of land between the Atlantic and the Gironde estuary, is the area's primary wine-producer. Its white and red wines strive more for quality than volume. Even closer to the city lies the Graves (gravelly) region, whose porous soil produces a grape distinctive in flavor. Southeast grows the grape from which sweet white sauternes are pressed. Across the river is Cognac, a town famous for distilling white grape juice into a brandy.

Owing to the inland position of Bordeaux, the largest ships do not reach its center, but tie up at the Bacalan quays. Upstream from there the river narrows and becomes shallow. A latter-day tendency has been for the city to grow toward the ocean. "Avant-ports" were developed during and after World War I at Bassens, Blaye, Pauillac, and Le Verdon.

In 1917-18 the entire Gironde estuary was a giant roadstead for disembarking American troops and supplies. At Le Verdon a monument commemorates the landing of the first United States soldier in 1917. It also recalls the 1777 departure from that point of Lafayette to help the American colonies win their independence.

Eighteenth-Century Atmosphere

The central city is situated on a broad crescent of the Garonne River. In addition to wines, its docks handle commerce to and from the whole world—plums, brandy, colonial produce, vinegar, grains, and manufactures. The city has long been a shipbuilding center. Population is near 260,000.

Bordelais are proud of their beautiful 18th-century-type city which has not been spoiled by commerce and industry (illustration, next page). The cathedral, art museum, and many churches and public works are among the best in France. The central quarter, laid out in streets and squares and parks in the 18th-century manner, is reminiscent of Versailles.

Bordeaux history dates from before Roman times. For three cen-

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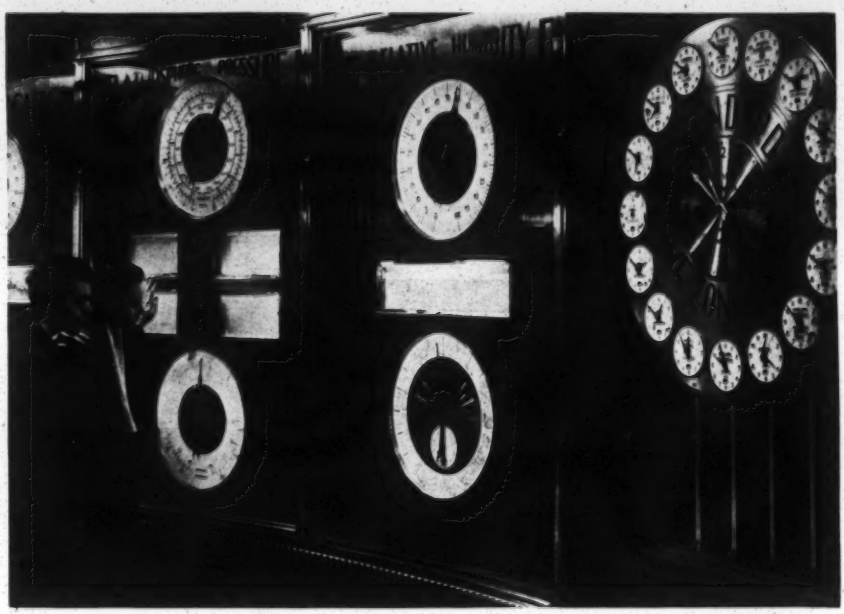
lion, is now, thanks to the atomic clock, accurate to one part in twenty million. The difference is that the new timepiece is based on the molecular activity of ammonia gas, rather than on the turning of the earth. The nitrogen atom in this gas vibrates back and forth 23,870,000,000 times a second.

Though this super-accuracy is beyond the needs and comprehension of the average layman, still his modern watch is accurate to an extent undreamed of by the early makers of watches and clocks (illustration, cover). Today's average watch does not vary by more than 10 or 12 seconds a day. A good watch has a hairspring that vibrates 18,000 times an hour. If it is off schedule by as few as 10 beats, the watch will gain or lose nearly a minute a day.

Latest available estimates indicate that perhaps 70 million Americans own watches, one for every two people in the country. That alone is a good indication of how important time has become in modern civilization.

Standard time zones (illustration, below) have been operating in the United States only since 1883. This uniform timekeeping system was enacted into law at the instigation of the spreading railroads, whose schedules were confused by local times.

NOTE: See also, "Split-Second Time Runs Today's World," in the *National Geographic Magazine* for September, 1947; and "Time and Tide on the Thames," February, 1939*; and, in the GEOGRAPHIC SCHOOL BULLETINS, February 23, 1948, "Scottish Queen Gave Girls Leap-Year Rights."



ROBERT F. SISSON

AT A GLANCE, THE CLOCKS AT THE RIGHT GIVE STANDARD TIME AROUND THE WORLD

New Yorkers who have trouble with such baffling problems as "What time is it in London when it is five o'clock in New York?" find the answer easily in this display in the Daily News Building. The small clocks compare the time in 16 of the world's 24 major time zones. The large timepiece in the center shows New York time. Weather information can be read from the gauges at the left.

turies in the Middle Ages England controlled the area, instilling in it a liberal and independent spirit still alive. During the French Revolution, the Girondists (mostly from Bordeaux) were moderate. Three times in modern history Bordeaux, because of its distance from German armies, has been the temporary capital of France.

During English domination, in 1441, the University of Bordeaux was founded. One of its best-known students was Montaigne, 16th-century essayist. He was the city's mayor for four years. He is buried in one of the university's buildings.

Stretching south of Bordeaux is the Landes, a peculiar geographic region. Originally a strip of sand along the Atlantic, it continually spread inland, pushed by sea-borne winds. About 1800, grasses and pine trees were planted experimentally to stop the march of the sand dunes. They succeeded so well that the plantings were continued. Today the Landes is one vast, rich pine forest from Bordeaux to Dax, 92 miles south.

NOTE: Bordeaux is shown on the Society's map of Europe and the Near East.
For additional information, see "Across the Midi in a Canoe," in the *National Geographic Magazine*, August, 1927.

MELVILLE CHATER

15TH-CENTURY GATE AND TWO-WHEELED CART GIVE THIS VIEW OF BORDEAUX AN ANTIQUE LOOK